Exergames

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Exergames

The miniaturization of computer hardware, particularly gaming joysticks and controls, has allowed for the creation of “exergames”, which epistemological roots derive from the combination of “exercise” and “digital gaming”. Indeed, exergames combine exercise with game play by emulating real life fitness, exercise and sport situations through motion sensor technology and virtual reality animations (Russell & Newton, 2008; Staiano & Calvert, 2011a). This relatively new video game modality requires physical exertion during game play and measures players’ movements and motor skills through a series of technological devices such as accelerometers and gyroscopes, cameras, pads and mats, and pressure and optical sensors (Rizzo, Lange, Suma, & Bolas, 2011; Russell & Newton, 2008).

Accordingly, the interaction with the video game is not solely based on traditional joysticks and hand-eye coordination, but involves the whole body through the use of non-standard controllers, such as Nintendo Wiimote, Balance Board or Microsoft Kinect sensor. Noteworthy, the exergames movement has redefined the video game industry and represents one of the leading technological trends in the sport and exercise sciences (Staiano & Calvert, 2011b). The purpose herein is to offer an overview of the target population, principles, types, benefits and educational perspectives of exergaming. First, the target population of exergames is outlined. Next, the governing principles of exergame systems are presented. Subsequently, the physical, psychosocial, and cognitive benefits of playing exergames are discussed in light of empirical research. Finally, educational applications and future perspectives on exergaming are discussed.

Target Population

Video game play is prevalent, nearly universal, among children and adolescents in the United States and various Western countries (Staiano & Calvert, 2011b). Recently, Lenhart et al.

(2008) conducted a comprehensive national survey in the United States and observed that 94% of girls and 99% of boys between 12- to 17- years old play video games. Video game play is also prevalent among young adults and middle-aged individuals, and has gained popularity among older adults as well (Brach et al., 2012). To this extent, since the late 1980s when Nintendo introduced the Nintendo Entertainment System and its alternative videogame consoles, active video game playing has increased among adults and the elderly (Taylor et al., 2012). Currently, exergames represent an alternative to traditional and sedentary video game playing (Staiano & Calvert, 2011b).

Although an array of individuals play exergames, game preferences exist by age and gender. Specifically, children favor richer designs while elderly prefer simpler screen layouts (Brox, Fernadez-Luque, & Tollesfsen, 2011). Gender differences exist in game preference with men favoring sport games whereas women tend to prefer racing and dancing games (Terlecki et al., 2011). Notwithstanding these differences, it is important to note that exergames are designed for numerous reasons and thus can be applied to various sub-population groups (see Brox et al., 2011). For instance, children and teenagers enjoy learning motor skills through health exergames (e.g., *Dance Dance Revolution*; see Lenhart et al., 2008). The military and airline pilots use gaming technology to simulate domain specific procedures (Orvis, Moore, Belanich, Murphy, & Horn, 2010). Athletes in general and golfers in particular may play video games to improve fine motor skills (Fery & Ponserre, 2001), while children with attention deficit hyperactivity disorder learn how to sustain attention using multimedia gaming technology (Rizzo et al., 2011). Children with developmental disorders can improve motor competence and mental health by playing virtual reality games (Straker et al., 2011). The elderly engage in video gaming for various reasons including to improve coordination and balance, socialize with friends, increase heart rate and burn calories (Brach et al., 2012). Altogether, different video game modalities are played in an array of domains (e.g., academia, military, special education, sports and physical rehabilitation) for entertainment, health, learning, or clinical reasons. Accordingly, this literature overview is not limited to a given sub-population group or applied context, but rather focuses on the principles common to various types of exergames.

Principles of Exergaming Design

Exergames are characterized by two important characteristics (see Figure 1). First, exergame development stems from a solid theoretical basis, deriving many of its principles from mainstream psychology as well as sport and human movement sciences. Furthermore, exergames rely on interactive features, particularly real-time feedback, multimedia channels, and dynamic interfaces.

Theoretical Basis

Video game technology relies on software engineering, logics, and artificial intelligence concepts (see Ghaoui, 2006). In addition to these computer programming requirements, video game technology is based on psychological and sport science frameworks (Hardy, Göbel, Gutjahr, Wiemeyer, & Steinmetz, 2012; Papastergiou, 2009). Several main psychological and sport and exercise science concepts employed by exergame designers are discussed next.

Psychological concepts. Concepts inherent in behaviorism are particularly evident in video game software and applications (Song & Kim, 2012). Games reward proper behaviors and actions with points, bonuses and status promotions (i.e., phase advancement). Conversely, if a player fails to adhere to the game’s rules, punishment occurs in the form of point deduction and stage blockage. Motivational constructs are also an element of video game design (Lenhart et al., 2008; Staiano & Calvert, 2011b). For instance, intrinsic motivation is established by allowing a player to create his/her own player profile, thus fostering a sense of identity and ownership during play. Extrinsic motivation derives from the outcome goals and competitive feelings associated with video gaming in general, and exergaming in particular (see Brox et al., 2011).

Another psychological anchor to exergame designs is the flow-feeling theory (see Csikszentmihalyi & Csikszentmihalyi, 1993). In effect, players are able to balance challenge and skill by adjusting built-in configuration controls (e.g., rhythm of music play, level of opponent in tennis or golf), thus advancing a sense of control while experiencing intense involvement in the exergame (Hardy et al., 2012; Sinclair, Hingston, & Masek, 2007). Moreover, Bandura's (1997) social cognitive theory is linked to video game design. Players are able to master a new skill by "taking risks" and are allowed "repetition" of a stage until successfully advancing to a more challenging level. Vicarious experiences, operationalized through modeling behaviors by virtual personal trainers, are also part of exergame applications (e.g., My *Fitness Coach* or *Daisy Fuentes Pilates* by Wii). Furthermore, applied research on ergonomic and situated cognition concepts has been used to develop games to simulate sport and military scenarios (e.g., *America's Army*; see Goodman, Bradley, Paras, Williamson, & Bizzochi, 2006; Orvis, Horn, & Belanich, 2009; Orvis et al., 2010). Finally, sport and exercise science constructs in general, and exercise physiology models in particular, are also important in designing active video game applications.

Sport and exercise science concepts. Similar to psychology, sport science is a vast domain with numerous applications to exergames (Papastergiou, 2009; Wilson, Darden, & Meyler, 2010). Of particular importance to exergame design are the sub-domains of exercise physiology as well as motor control and learning. The notion of periodization, as broadly conceived as the balance between training volume and intensity aimed at ensuring overcompensation (see Issurin, 2010), is present in exergames such as *Yourself!Fitness* and *The Biggest Loser* by Xbox 360 - THQ. Consideration of anthropological and anthropometrics covariates (e.g., age, gender, height and weight) is an critical feature of video game playing aimed at emulating real life fitness and exercise agendas (Brach et al., 2012; Graves et al., 2010; Terlecki et al., 2011). Perhaps more subtle to the average player or individual unfamiliar with the sport science literature is the influence of different practice schedules (e.g., constant, random, blocked) on performance and learning of games with a strong motor skill requirement (e.g., *Dance Dance Revolution*, *Wii Sports Bowling*, *Tennis*, *Boxing* and *NBA Wii*). Furthermore, feedback, a concept vastly studied in motor learning, is an important interactive feature of exergames.

Interactive Features

Real-time feedback. Exergames are designed to provide real-time augmented extrinsic information. In effect, a key feature of exergames is to initially measure a variable of interest (e.g., players' reaction time, force), and subsequently offer related information to the player (Giggins, Persson, & Caulfield, 2013). More specifically, information provided to the player can be either: (1) *direct feedback* by showing numerical values in regards to one's reaction time or power output for instance, or (2) *transformed feedback* in the form of a sensorial stimuli such as tactile information, sound or visual image (Rizzo et al., 2011). Noteworthy, the real-time feedback property common to exergames is essential to capture and sustain the players' motivation during gameplay (Courts & Tucker, 2012). Multi-sensorial stimuli are another important governing principle of exergames.

Multimedia applications. Exergame playing is an immersive experience as it generates multi-sensorial impressions that create a feeling of being present in a simulated world (Filho, 2015; Hardy et al., 2012; Russell & Newton, 2008). In fact, multimedia stimuli are thought to enhance individuals' engagement and learning experiences (Courts & Tucker, 2012). To this extent, empirical evidence suggests that people remember approximately 20% of what they hear, 40% of what they hear and see, and 75% of what they hear, see, and interact with (Eskicioglu & Kopec, 2003). Accordingly, the multimedia channels common to exergames embrace different types of learners, thus allowing players with different cognitive and learning styles (e.g., kinesthetic, visual) to appreciate and manage their own gaming experience.

Dynamic interfaces. A key feature of exergaming technology is its reliance on innovative exertion interfaces, rather than traditional game controllers such as a joystick, gamepad or mouse (Papastergiou, 2009). These dynamic interfaces (e.g., bicycle ergometers, electronic dance pads, tracking cameras, musical instruments) are crucial to exergaming technology as, without them, electronic games are primarily sedentary activities (Russell & Newton, 2008; Staiano & Calvert, 2011a). Thus, the development of dynamic interfaces allows exergames to exist. In this regard, Wilson et al. (2011) noted that "exergaming is associated with participants becoming *human joy sticks* as they must move their bodies instead of just their thumbs in order to play the games" (p. 14). Noteworthy, the Nintendo Wii sold 24.5 million consoles in 2008, whereas the recently launched Xbox One (by Microsoft) and the PlayStation 4 (by Sony) are attempting to win costumers by marketing their consoles as "the best gaming console possible", and the "media device that can do it all", respectively (Business Insider, 2013). This technological and marketing trend aimed at making better gaming consoles is ultimately increasing the applicability of exergames to both practitioners and researchers interested in the benefits of different types of active video game playing.

Types of Exergames and Health Gaming

Exergames can be categorized according to their methodological features, which may be primarily based on control, rhythmic, machines, workout or sensory parameters. Exergames are also linked to a larger gaming movement labeled “Health Gaming” (Brox et al., 2011; Lee, 2012).

Types of Exergames

A typology common to most exergames pertains to its “entertainment first approach”, meaning exergames are designed to create movement immersive and cognitively enjoyable experiences (Lenhart et al., 2008; Papastergiou, 2009; Staiano & Calvert, 2011b). A more operational typology for exergaming has been proposed by The Exergame Network (see http://exergamenetwork.blogspot.com; see Figure 2). This typology, used by practitioners interested in developing exergaming facilities (Wilson et al., 2010), is based on the notion that exergames can be classified according to their extrinsic methodological feature into several categories: (a) control exergaming, (b) rhythm exergaming, (c) exergaming machines, (d) workout exergaming, and (e) sensory exergaming. Control exergaming includes those in which players’ body movements are captured by the game, thus literally serving as the “control” for any action. Rhythm exergaming requires that players follow the beat of the music while the exergame registers their timing and dance steps. Exergaming machines use real fitness equipment (e.g., stationary bikes, “cybercycle”) while people play interactive games aimed at diverting their attention from the exertive task. Workout exergames are built around the figure of a virtual personal trainer, who provides feedback and stores individual training progress. Lastly, sensory exergaming utilizes motion sensor technology to convert jumps, air punches, and runs to points. It is important to note that although practically and conceptually appealing, this typology is descriptive in nature and primarily based on face validity. Accordingly, sport and exercise psychologists should conduct further research pertaining to exergame classification systems and operational frameworks. Movement science professionals should also be aware of, and make use of, health gaming aimed at promoting active life styles.

Health Gaming

Exergames are part of a larger movement labeled "Health Gaming" (Brox et al., 2011; Goodman et al., 2006; Russell & Newton, 2008; Staiano & Calvert, 2011a). Although health games may neither merge exercise movement with gaming technology nor ascribe to the "entertainment first approach", they are important educational tools. In fact, health games have been used to develop clinical applications for specific sub-population groups, as well as "whole-person wellness" programs for people of all ages (Sinclair et al., 2007).

Clinical Applications. There are several health games specifically designed for clinical conditions, including blindness (e.g., *Eyes-Free Yoga*), autism (e.g., *Nurfland*), diabetes (e.g., *Escape from Diab*), as well as asthma, cerebral palsy, dementia and hypertension (for a review see Staiano & Flynn, 2014). Although many games are designed with a particular clinical condition in mind, all health games are created to allow for *self-paced learning* and *in-home therapy* (see Lee, 2012). In fact, most newly developed health games use easy touchscreen interfaces (e.g., IPAD), thus allowing people with disabilities to better control (i.e., self-pace) their learning experience. Moreover, health games are multi-sensorial experiences and include motivating graphics and sounds effects. As a result, health games are more likely to be incorporated into one's everyday life (particularly children), and thus serve the purpose of an in-home therapy practice.

Whole-Person Wellness Programs. In terms of general well-being across age-cohorts, health gaming has been used to educate individuals on dietary choices, hygiene habits, and injury and illness prevention. Indeed, there are a number of games directed at teaching children about healthy nutritional choices (e.g., *My Plate*; *Escape from Obez City*) and hygiene habits (e.g., *Grush*; *The Kids Corner*). Furthermore, there is evidence suggesting that video gaming can be used to educate children about injury prevention in contact sports (Goodman et al., 2006). Also noteworthy, health gaming has been increasingly used to educate teenagers on sensitive topics such as sexuality (e.g., *Play it Safe*; *Freedom HIV*) and drug use and abuse (e.g., *Trauma*).

For adult individuals, there are numerous games aimed at promoting behavioral change and self-awareness. For instance, those dealing with a smoking addiction may benefit from playing *My Stop Smoking Coach with Allen Carr*. People experiencing anxiety symptoms may consider playing *Never-Mind* or *Zenytime* to gain awareness on how to deal with cognitive and somatic anxiety related responses. Finally, several health games have been developed to address the needs of older adults (Van Riet, Crutzen, & Shirong, 2014). For instance, The *Step Kinnection* and *Brain Fitness* have been tested as potential tools to diminish falling accidents and memory decay among older adults (Miller et al., 2013; Staiano & Flynn, 2014). Furthermore, *Sun Safety* and *IronPigs* aim to teach older adults behaviors to diminish the likelihood of skin and prostate cancer, respectively.

Additional games for clinical and non-clinical applications exist, such as games on safe cross-walking and wheel-chair use (see Brox et al., 2011). In all, the applicability of gaming technology in health and exercise settings is likely to increase in the years to come as researchers and practitioners continue to unravel the physical and psychosocial benefits of mixing health and exercise with active digital gaming (Adkins et al., 2013; Fogel, Miltenberger, Graves, & Koehler, 2010; Papastergiou, 2009).

Benefits of Exergaming

Although research on exergaming is in the initial stages, growing evidence suggests the positive physical and psychosocial outcomes of active video game playing. The physical benefits include increased caloric expenditure, improved cardiovascular fitness, and gains in coordination and balance. The psychosocial gains of exergaming include enhanced motivation, self-esteem and self-efficacy, and opportunities for positive social interaction.

Physical Outcomes

Energy expenditure and heart rate increase. While traditional video games contribute to sedentary behaviors, exergames promote exercise during game play (Graves et al., 2010; Giggins et al., 2013; Klein & Simmers, 2009). In fact, exergames are seen as a potential tool to combat childhood obesity, which is increasingly associated with lack of physical activity (Daley, 2009; Fogel et al., 2010). According to Sinclair et al. (2007), exergames are particularly important to decelerate obesity rates given the trend of “increased screen time and decreased physical activity” (p. 289). In fact, the majority of studies on the physical outcomes of exergaming have been focused on energy expenditure (Papastergiou, 2009). Recently, Smallwood, Morris, Fallows, and Buckley (2012) reported that *Kinetic Sports Boxing* and *Dance Central* increased energy expenditure by 263% and 150%, respectively, when compared to resting values. Other scholars have also empirically demonstrated that exergaming increases energy expenditure when compared to sedentary video gaming (Adkins et al., 2013; Duncan & Dick, 2012; Fogel et al., 2010).

Additionally, exergaming has been found to increase heart rate, an important dimension of aerobic fitness (Graves et al., 2010; Kloos, Fritz, Kostyk, Young, & Kegelmeyer, 2013). For instance, Siegel, Haddock, Dubois, and Wilkin (2009) observed that participants playing 30 minutes of a boxing exergame reached 60% or more of their heart rate reserve, a value within the American College of Sports Medicine recommendation for daily physical activity. Garn, Baker, Beasley, and Solmon (2012) studied the physical implications of playing *Run Wii Fit* and concluded that the "game provided opportunities to accumulate moderate to vigorous physical activity" (p. 311). Importantly, different exergames are associated with different heart rate and caloric expenditure demands (Duncan & Dick, 2012; Smallwood et al., 2012). For instance, boxing, running and dancing exergames require more physical demand than golfing. Movement professionals should also be aware of the fact that exergames are not a substitute for more traditional physical activity behaviors (e.g., pick-up basketball games), which lead to significantly greater energy expenditure and neurophysiological benefits (Nye, 2011; O'Leary, Pontifex, Scudder, Brown, & Hillman, 2011). Movement professionals should also be attentive to potential coordination gains linked to exergaming.

Coordination and balance. There is initial evidence suggesting that exergaming may lead to gains in coordination and balance (Byrne, Roberts, Squires, & Rohr, 2012). Fery and Ponserre (2001) reported a positive transfer of golf video playing to actual putting skill. Specifically, they concluded that exergaming may be a useful training tool to teach people how to adjust force in order to successfully putt in golf. In regards to balance, Kosse, Caljouw, Vuijk, and Lamoth (2011) observed gains in dynamic balance among elderly participating in a six week training using *SensBalance Fitness Board* as a training platform (Sensamove, the Netherlands). Nintendo Wii Fit exercises have also been found to be effective training tools to improve static postural sway and dynamic balance among college students (Gioftsidou et al., 2013). Furthermore, in an experimental protocol, Byrne et al. (2012) noticed significant post-training improvements in dynamic balance among young adults playing Wii Fit. It is important to add that, congruent with research on skill acquisition and expert performance in sport sciences (Williams & Ericsson, 2008), gains in balance through exergaming were found to be specific to the muscle groups involved in the task (Byrne et al., 2012; Gioftsidou et al., 2013). Additional research is needed to determine the applications and implications of exergaming for motor skill acquisition in general, and coordination and balance in particular.

Psychosocial Outcomes

Motivation and enjoyment. Exergames elicit a strong motivational response from participants (Lenhart et al., 2008; Staiano & Calvert, 2011b). The “novelty factor” associated with exergaming also carries an inherently motivational component. Furthermore, the balance of challenge and skill level, along with interactive features unique to exergames (i.e., multimedia and dynamic interfaces), fosters engagement, enjoyment, and “flow-feeling” states (Hardy et al., 2012; Sinclair et al., 2007). Empirical evidence echoes the notion that exergames are engaging and enjoyable experiences. For instance, Graves et al. (2010) observed higher enjoyment rates for Wii aerobics in comparison to treadmill and walking exercise for adolescents, young adults, and older adults. Sun (2012) found that interest for exergaming was higher than for regular fitness lessons among elementary children participating in physical education classes. Garn et al. (2012) studied the benefits of playing *Run Wii Fit* and concluded that exergaming provides motivational benefits to its players, particularly to those classified as obese. In this regard, Hepler, Wang, and Albarracin (2012) averred that exergames are a home-modality virtual media, and therefore may provide an exercise alternative for people lacking motivation to join a gym or engage in more traditional exercise modalities and routines. The possibility of using exergames at home may also prevent self-presentation concerns common to gyms in general and group exercise classes in particular (Lee, 2012).

Self-esteem and self-efficacy. Self-presentation concerns are a common barrier to physical activity, particularly to overweight individuals (Prapavessis, Grove, & Eklund, 2004). To this extent, exergaming may reduce body self-consciousness while increasing self-esteem and efficacy beliefs in obese adolescents (Staiano & Calvert, 2011b). In effect, exergame players are required to direct their focus outward during play (to the visual, tactile and sonic effects proper to exergaming). Staiano, Abraham, and Calvert (2013) examined the influence of a 20-week exergame intervention on weight loss and psychosocial outcomes among overweight and obese adolescents. Results indicated positive outcomes in both self-efficacy and self-esteem as measured at baseline and at the conclusion of the program. The authors highlighted the benefits of cooperative exergaming, which was found to promote weight loss when compared to a control group.

Social benefits. Excessive traditional video game playing is associated with social isolation (Sublette & Mullan, 2012), while playing violent games is considered a causal risk for increased aggressive behavior (Anderson et al., 2010). In contrast, exergaming is thought to promote positive social outcomes through multi-player modes (Papastergiou, 2009). Indeed, social interaction is a primary reason why young adults play *Dance Dance Revolution* (Staiano & Calvert, 2011b). Multiplayer games are also common among adolescents. Lenhart et al. (2008) reported that 76% of teenagers play multiplayer games at least occasionally, with 65% of them playing in the same room. Playing exergames against peers has been found to produce greater exercise intensities and energy expenditure when compared to no-competition or competing against a virtual competitor (fiction, computer generated; see Snyder, Anderson-Hanley, & Arciero, 2012; Staiano et al., 2013). The numerous social benefits of exergaming are an important argument for schools and teachers interested in developing physical education curriculum while advancing pedagogical principles applied to exergaming (Hall, 2012; Hardy et al., 2012).

Applied Perspectives on Exergaming

Exergaming can be used as an educational tool in physical education as well as in other disciplines and classroom environments (Hall, 2012; Hardy et al., 2012). According to Eskicioglu and Kopec (2003), the focus of technological education in general, and of exergaming curriculums in particular, should be on procedural knowledge ("hands and minds on education"). Specifically, the focus should be on education *with technology* rather than education *about technology*. Accordingly, students should learn how to apply knowledge through the management of their own multimedia experience. In effect, exergaming creates multi-sensorial experiences, allowing individuals with different preferred learning styles (e.g., auditory, kinesthetic, visual) to acquire and retain new and complex information (Filho, 2015). Bearing in mind that people have different learning styles, teachers and practitioners should include both competitive and cooperative exergames in their classrooms and applied practice (for a review see Marker & Staiano, 2015). Competitive exergames lead to greater energy expenditure when compared to playing alone. Engaging in cooperative play helps to develop empathy skills, as people must take each other's perspective to succeed in the game.

Exergaming education should also be both holistic and systemic in nature (Kim, Hannafin, & Bryan, 2007). In particular, teachers and instructors should expose students to a multitude of different concepts (holistic) while explaining how these various concepts are simultaneously inter-connected (systemic). For instance, a physical education teacher may lecture on how the various physiological systems (e.g., neuromuscular, cardiovascular, endocrinal) are inter-related during endurance exercise. Students may also be taught periodization training or how to use mental skills to control attentional focus during an exertive task. Overall, educators should not only offer instrumental feedback to their students, but also assume multiple critical roles, thus serving as motivators, models, collaborators, experimenters, guides and innovators (Crawford, 2000). The importance of advancing pedagogical principles on technological literacy shall remain an area of future research interest.

Future Directions for Research and Practice

From a research standpoint, it is important to continue advancing experimental trials targeting the bio-psycho-social outcomes of exergaming. Clinical trials are essential for health games aimed at promoting a healthier life style. Longitudinal studies are also warranted, as the long-term effects of exergaming, as well as the sustainability of whole-person wellness programs, have not been established yet. Legal issues and the licensing of active video gaming technology are also growing fields of research. More generally, scholars should report null results and address the negative effects of game playing, such as aggression and anti-social behaviors. Without reporting null findings and targeting the negative aspects of active video game playing it will be impossible to establish guidelines for safe health and exergaming playing (Kato, 2012).

Basic scientific approaches, particularly neuro-scientific, are welcomed areas of research, as only a few studies on brain imaging in exergaming exist. Of note, Massachusetts Institute of Technology and the Max Planck Institute are currently leading a large-scale and promising neuro-scientific approach on active video game playing. Specifically, the EyeWire project aims to map neurons in 3D by collecting data of video game players (180,000 as of April, 2015). The findings from the study might help to elucidate how billions of neurons connect to process visual information.

From an applied standpoint, practitioners should continue to advance curriculum ideas on exergaming. Furthermore, interested practitioners should move from knowledge application to knowledge creation. Advancing knowledge on how to maintain and design new technological products and systems is also under the auspices of movement scientists and sport and exercise psychologists. Additionally, establishing biofeedback learning environments integrated within exergaming contexts would also be a step forward in the practice of sport and exercise psychology. In all, exercise psychologists should continue furthering their technological literacy and ability to translate hi-tech gaming into tools to foster exercise adoption and adherence.

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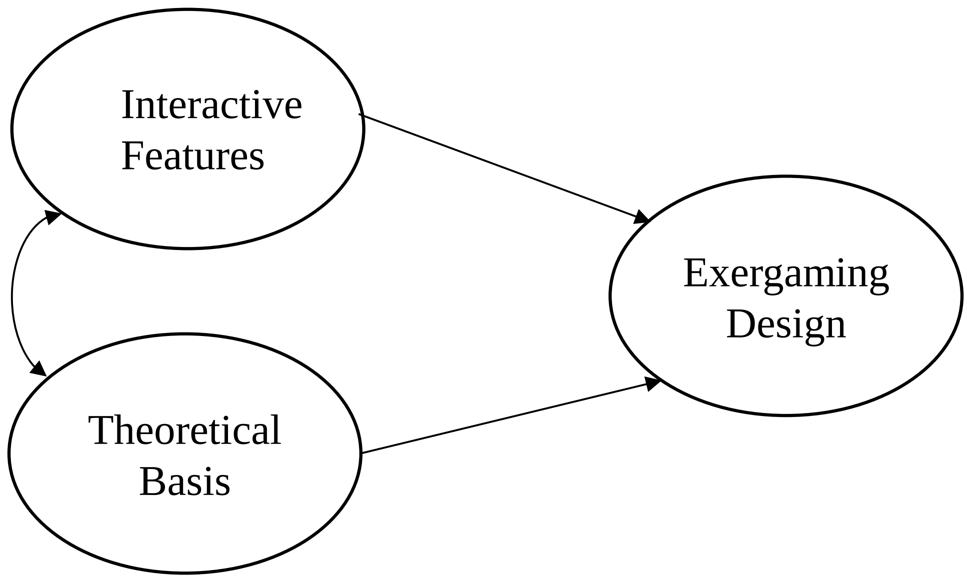

Figure 1. Principles of Exergaming Design

Control	Rhythm	Machines	Workout	Sensory
1. Eyetoy 2. Wii Sports 3. Your Shape	1. Guitar Hero 2. Just Dance 3. iDANCE	1. Gamercize 2. Fitclub 3. BrainBike	1. EA Sports Active 2. The Biggest Loser 3. Wii Fit Plus	1. Lightspace Play 2. Makoto 3. TWall

Figure 2. Typology of Exergaming and Applied Examples